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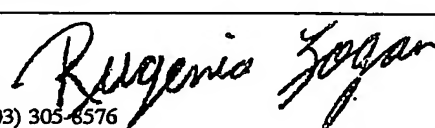
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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2349-104WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US01/48253	International filing date (day/month/year) 14 December 2001 (14.12.2001)	Priority date (day/month/year) 15 December 2000 (15.12.2000)
International Patent Classification (IPC) or national classification and IPC  IPC(7): G08B 13/14; B32B 31/00; H01Q 1/44, 7/00; H01R 43/00; H01L 23/02, 41/04, 41/08 and US Cl.: 340/572.1, 572.7, 572.8; 156/292, 278; 343/856, 866, 870; 29/825; 257/679; 310/313R		
Applicant  ELECTROX CORP.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>9</u> sheets.</p> <p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 15 July 2002 (15.07.2002)	Date of completion of this report 05 March 2003 (05.03.2003)	
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Benjamin C. Lee Telephone No. (703) 305-6576 	

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US01/48253

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

☐ the international application as originally filed.☒ the description:pages 1-7 as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of \_\_\_\_\_.☒ the claims:pages NONE, as originally filedpages NONE, as amended (together with any statement) under Article 19pages NONE, filed with the demandpages 8-10, filed with the letter of 20 February 2003 (20.02.2003)☒ the drawings:pages NONE, as originally filedpages NONE, filed with the demandpages 1-6, filed with the letter of 08 August 2002 (08.08.2002)☐ the sequence listing part of the description:pages NONE, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of \_\_\_\_\_.

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☒ The amendments have resulted in the cancellation of:☐ the description, pages NONE☐ the claims, Nos. NONE☐ the drawings, sheets/fig NONE5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

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PCT/US01/48253**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)	Claims <u>1-21</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>5 and 18-21</u>	YES
	Claims <u>1-4 and 6-17</u>	NO
Industrial Applicability (IA)	Claims <u>1-21</u>	YES
	Claims <u>NONE</u>	NO

**2. CITATIONS AND EXPLANATIONS**

Please See Continuation Sheet

Claims 5 and 18-21 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest: 1) the specific configuration/construction of the inductive first and second coils coupling between the antenna and the RFID silicon chip as specified in claim 5; 2) the RFID device manufacturing process in which a silicon die having an electromagnetic coil metal pattern around its periphery is placed in alignment to a metal toner electromagnetic coil pattern on a substrate, whereby the metal toner coil pattern has been coated with a suitable adhesive layer as specified in claims 18-21.

Claims 1-21 meet the criteria set out in PCT Article 33(4), and thus meet industrial applicability because the subject matter claimed can be made or used in industry.

## Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

## V. 2. Citations and Explanations:

Claims 1-4 and 6-11 lack an inventive step under PCT Article 33(3) as being obvious over Vega et al. (US pat. #5,147,605) in view of Nysen et al. (US pat. #5,095,240).

1) In considering claims 1 & 3, Vega et al. discloses:

a) the claimed RFID device (100) comprising a substrate (110); an antenna means (112, 114) on said substrate; at least one integrated circuit means (116); and a connection means (pad according to col. 4, lines 47-50) for electrically connecting said antenna means and said integrated circuit means; except: specifying that the integrated circuit means is the claimed silicon chip. However, since Figs. 1-2 show that the integrated circuit is in chip form and the use of pads for connecting antenna elements 112, 114 to the integrated circuit 116 also suggest the use of an integrated circuit chip, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to use a chip form of an integrated circuit for implementation in a device such as taught by Vega et al., and furthermore that such a chip is conventionally a silicon chip;

Vega et al. does not disclose:

b) the claimed wherein said connection means is comprises of: a first coil means connected to said antenna means and a second coil means connected to said silicon chip, wherein said first coil means and said second coil means are proximally located thereby facilitating electrical communication, and said first coil means is comprises of at least 2 loops.

While Vega et al. teaches a contact type connection between the antenna means and the silicon chip, it has been known in the art to use an alternative contactless connection using first and second coils for inductive coupling (Figs. 1 & 4 and corresponding disclosure) to provide an extremely small, thin and yet robust package (col. 2, lines 40-47), whereby the inductive coupling coil can comprise at least 2 turns/loops (coil formed by "at least one turn of an electrical conductor" according to col. 2, lines 6-10). In view of the teachings by Vega et al. and Nysen et al., it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that a known contactless connection such as taught by Nysen et al. can be used as the connection in a device such as taught by Vega et al. to provide a small yet robust package for applications which require or can benefit such small yet robust packaging, wherein since the antenna means of Vega et al. are not of the coil type, that first and second coil means would be required for coupling the chip and the antenna means.

2) In considering claim 2, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 1, including: the claimed wherein said connection means is comprised of an electrically conductive adhesive (col. 5, lines 43-52 of Vega et al.).

It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to use the electrically conductive adhesive of Vega et al. as connecting/bonding means for the connection between the first and second coils and the respective antenna and silicon chip in Vega et al. and Nysen et al.

3) In considering claims 4 & 6, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claims 1 and 3, respectively, whereby: it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that using a dielectric layer separation of said at least 2 loops provides fine-tuning of the inductance for coupling by controlling the dielectric constant and thus the inductance of the coil, as opposed to that of air when not using a dielectric layer, in a device such as taught by

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Vega et al. and Nysen et al. so that the desired parameters can be implemented as intended.

4) In considering claim 7, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 3, including: the claimed said second coil means is located on said silicon chip (Fig. 1 of Nysen et al.)

5) In considering claim 8, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 1, including: the claimed wherein said antenna means is printed on said substrate (col. 5, lines 15-17 of Vega et al.).

6) In considering claims 9, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 8, except: specifying that said printing is by electrostatic or inkjet printing methods. Vega et al. teaches that any suitable process including printing can be used (col. 5, lines 15-17). It would have been obvious to one of ordinary skill in the art at the time of the claimed invention that electrostatic or inkjet printing methods are suitable printing methods for printing the antenna means on the substrate in a device such as taught by Vega et al. and Nysen et al.

7) In considering claim 10, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 3, plus the consideration of claim 9.

8) In considering claim 11, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 7, plus the consideration of claim 9, wherein: it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that various second coil means forming method known in the art including the known electrostatic or inkjet printing methods can be used in a device such as taught by Vega et al. and Nysen et al. without unexpected results.

Claim 12 lacks an inventive step under PCT Article 33(3) as being obvious over Vega et al. in view of Nysen et al. and Tuttle et al. (US pat. #6,045,652).

1) In considering claim 12, Vega et al. and Nysen et al. made obvious all of the claimed subject matter as in claim 1, except: the claimed protective coating.

In the same art, Tuttle et al. teaches the use of protective coating of a tag device (Figs. 13A-B). In view of the teachings by Vega et al. and Tuttle et al., it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that a protective coating such as taught by Tuttle et al. can be used in a device such as taught by Vega et al. and Nysen et al. to provide protection to the device from degrading factors such as environmental elements.

Claims 13-14 and 16-17 lack an inventive step under PCT Article 33(3) as being obvious over Tuttle et al.

1) In considering claim 13, Tuttle et al. disclosed:

- a) claimed process for manufacturing RFID devices (Figs. 13A-B);
- b) claimed printing of a metal element on a coated substrate (col. 12, lines 55-58; col. 13, lines 20-42);
- c) claimed drying of this metal element image (inherent drying of the circuit trace, etc. before the next step);
- d) claimed mechanical placement of a silicon die on this dried printed metal element image (col. 14, lines 4-8);
- e) claimed the heating of this assembly to a suitable temperature causing a sintering of the metal element particles together and a sintering of them to the electrode pads of the silicon die (steps 480-490);
- f) claimed overcoat of the die/substrate with a protective coat (step 500);

except:

g) the claimed wherein the printing is electrostatic printing and the metal element is metal toner.

While Tuttle et al. disclosed printing of metal elements such as metal ink. However, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that known alternatives including electrostatic printing of metal toners can be used in a device such as taught by Tuttle et al. based on preference of manufacturing process, existing equipment and other factors for implementing the device assembly to provide the final desired characteristics as intended.

2) In considering claim 14, Tuttle et al. made obvious all of the claimed subject matter as in claim 13, including: the claimed silver (col. 13, line 26-28).

3) In considering claim 16, Tuttle et al. made obvious all of the claimed subject matter as in the consideration of claim 13.

4) In considering claim 17, Tuttle et al. made obvious all of the claimed subject matter as in the consideration of claim 13, except:

—specifying the claimed coating is chosen from Saran™ resins of Dow Chemical.

Tuttle teaches coating with a barrier layer such as polyethylene and or PVDC as examples (col. 13, lines 1-10). However, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that various similar, known and available coating material including those chosen from Saran™ resins of Dow Chemical can be used as the particular coating in forming a device such as taught by Tuttle et al. without unexpected result, especially if it provides the intended properties at an agreeable price.

Claim 15 lacks an inventive step under PCT Article 33(3) as being obvious over Tuttle et al. in view of Masahiko (US pat. #5,852,289).

1) In considering claim 15, Tuttle et al. made obvious all of the claimed subject matter as in claim 13, except:

—specifying the claimed PET (polyethylene terephthalate) film or paper substrate.

Tuttle teaches the use of polymer film such as polyester film laminated with a barrier layer such as polyethylene and or PVDC as examples (col. 13, lines 1-10). Masahiko teaches that use of PET as a film in an RFID device has been known in the art

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(col. 9, lines 24-25). In view of the teachings by Tuttle et al. and Masahiko, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention that various similar films known in the art including PET such as taught by Masahiko can be used as the particular film in forming a device such as taught by Tuttle et al. without unexpected result.

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**CLAIMS:**

Claim 1 An RF-ID device comprising

a substrate;

an antenna means on said substrate;

5 at least one silicon chip; and

a connection means for electrically connecting said antenna means and said silicon chip having a first coil means connected to said antenna means and a second coil means connected to said silicon chip;

wherein said first coil means is comprised of at least two loops.

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Claim 2. The RF-ID device of claim 1 wherein said connection means is comprised of an electrically conductive adhesive.

Claim 3. The RF-ID device of claim 1 wherein said first coil means and said second coil means are proximally located thereby facilitating electrical communication.

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Claim 4. The RF-ID device of claim 1 wherein each of said at least two loops is separated by a layer of dielectric.

20 Claim 5. The RF-ID device of claim 4 wherein said first coil means has at least a first and a second loop each loop having two endpoints,

wherein a first loop is located on said substrate and

a second loop is located on a dielectric layer located above said first loop,

wherein one endpoint of said first loop is connected to said antenna means and the

25 second endpoint of said first loop is connected to the first endpoint of said second loop through a hole in the dielectric layer and

wherein the second endpoint of said second loop is connected to said antenna means through an opening in the dielectric layer.

30 Claim 6. The RF-ID device of claim 3 wherein said first coil means is comprised of at least two loops wherein each of said at least two loops is separated by a layer of dielectric.

Claim 7.. The RF-ID device of claim 3 wherein said second coil means is located on said silicon chip.

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Claim 8. The RF-ID device of claim 1 wherein said antenna means is printed on said substrate.

5 Claim 9. The RF-ID device of claim 8 wherein printing is by electrostatic or inkjet printing methods.

Claim 10. The RF-ID device of claim 3 wherein said connection means is printed by electrostatic or inkjet printing methods.

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Claim 11. The RF-ID device of claim 7 wherein said second coil means is printed by electrostatic or inkjet printing methods.

Claim 12. The RF-ID device of claim 1 further comprising a protective coating.

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Claim 13. A process for the manufacture of RF-ID devices consisting of the following:

- a. electrostatic printing of a metal toner on a coated substrate;
- b. the drying of this metal toner image;
- c. the mechanical placement of a silicon die on this dried, printed metal
- 20 toner image;
- d. the heating of this assembly to a suitable temperature causing a sintering of the metal toner particles together and a sintering of them to the electrode pads of the silicon die; and
- e. the overcoat of the die/substrate with a protective coat.

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Claim 14. The process of claim 13 in which the metal toner is made of silver.

Claim 15. The process of claim 13 in which the substrate is PET film or paper.

30 Claim 16. The process of claim 13 in which the substrate is coated with an adhesion/sintering layer that promotes both sintering of the metal particles and their adhesion to the substrates.

REPLACEMENT SHEET

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Claim 17. The process of claim 13 in which this coating is chosen from Saran™ resins of Dow Chemical.

Claim 18. A process for the manufacture of RF-ID devices in which

- 5 a. metal toner is printed on a suitable substrate in a suitable pattern;
  - b. the pattern in the area of silicon chip mounting is configured into a single or multi-turn electro-magnetic coil;
  - c. this pattern is suitably processed into a conductive metal pattern;
  - d. the substrate is coated with a suitable adhesive layer;
  - 10 e. a silicon die possessing an electromagnetic coil pattern of metal around its periphery is placed and aligned to the metal toner coil pattern of the substrate;
- and
- f. the bonding reaction between die and adhesive coated substrate is completed by suitable means.

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Claim 19. The process of claim 18 in which the die has been "thinned" to a value below 50 microns.

Claim 20. The process of claim 19 where the substrate thickness is less than 50 microns.

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Claim 21. The process of claim 20 where the overall thickness of the final part is between 10 and 100 microns.

REPLACEMENT SHEET

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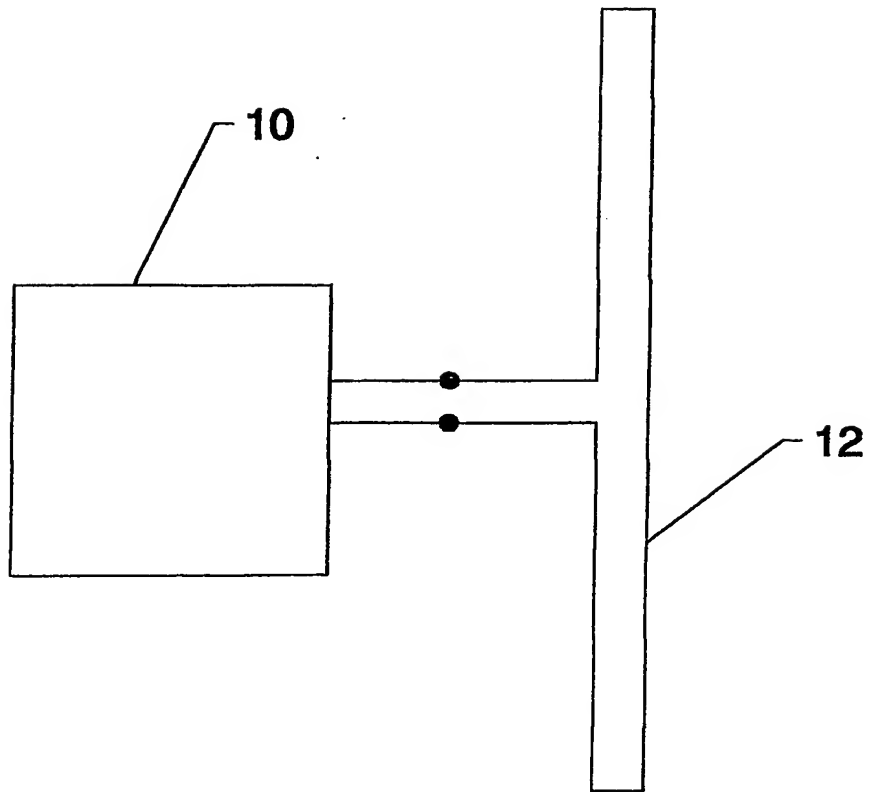


Figure 1

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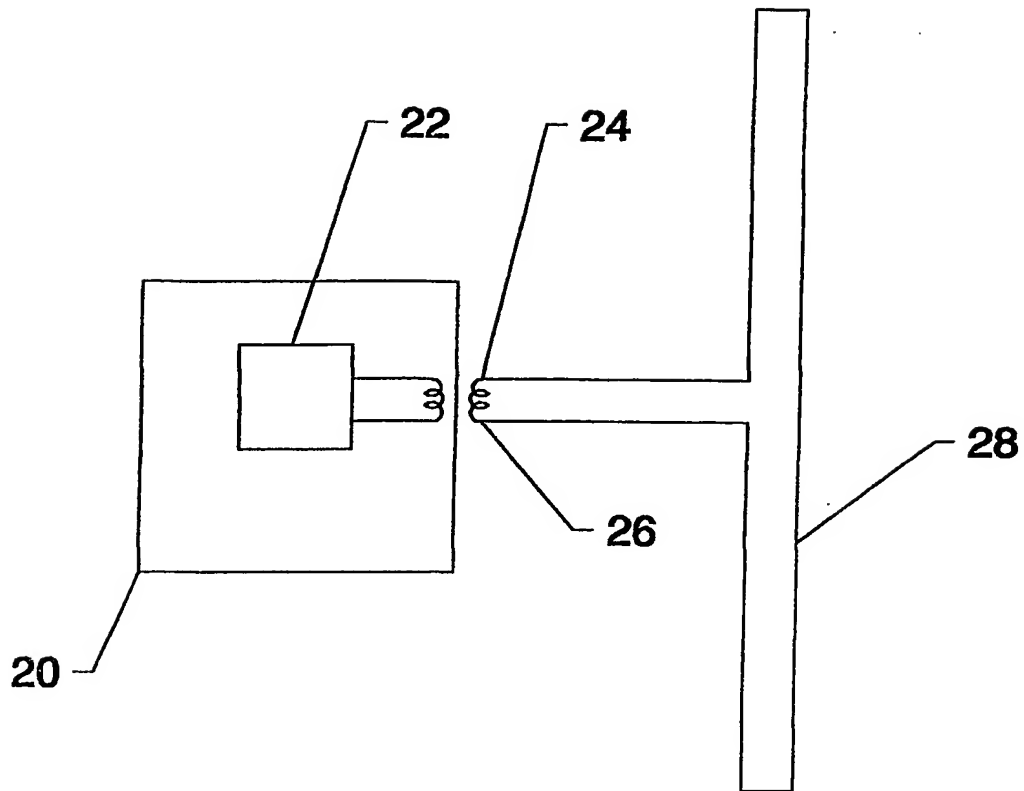


Figure 2

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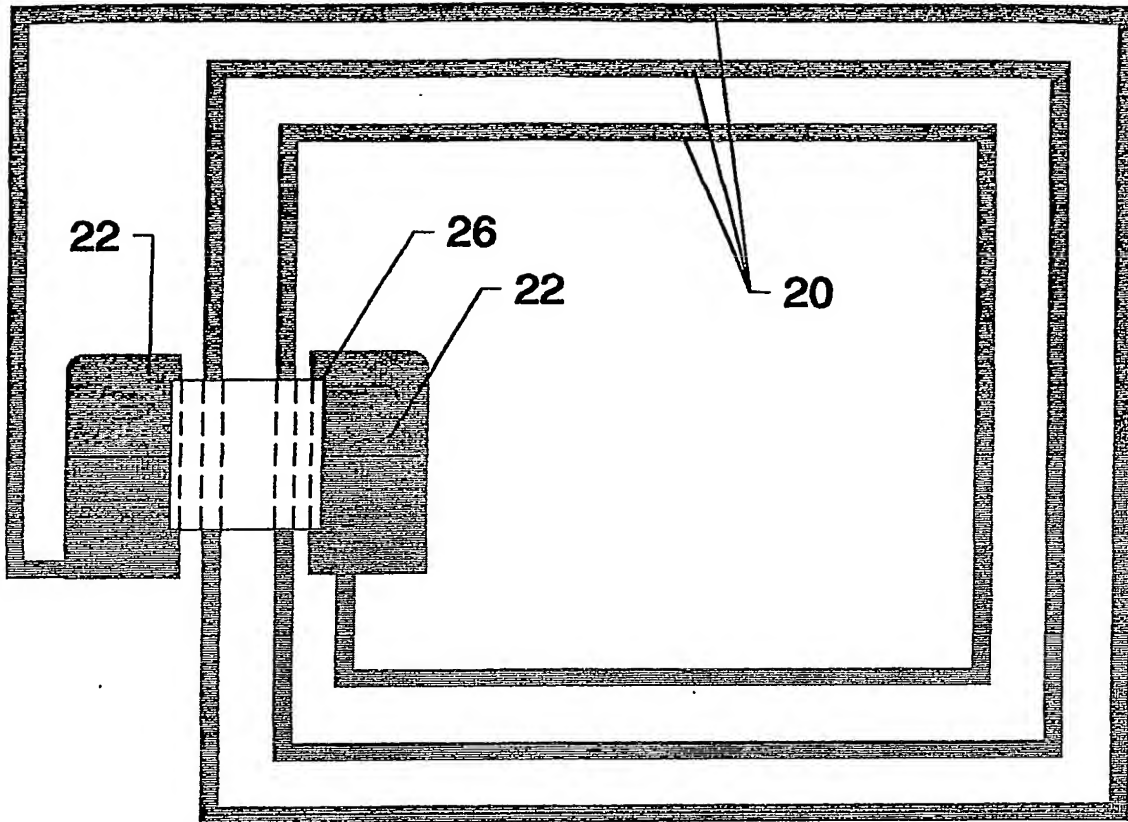


Figure 3

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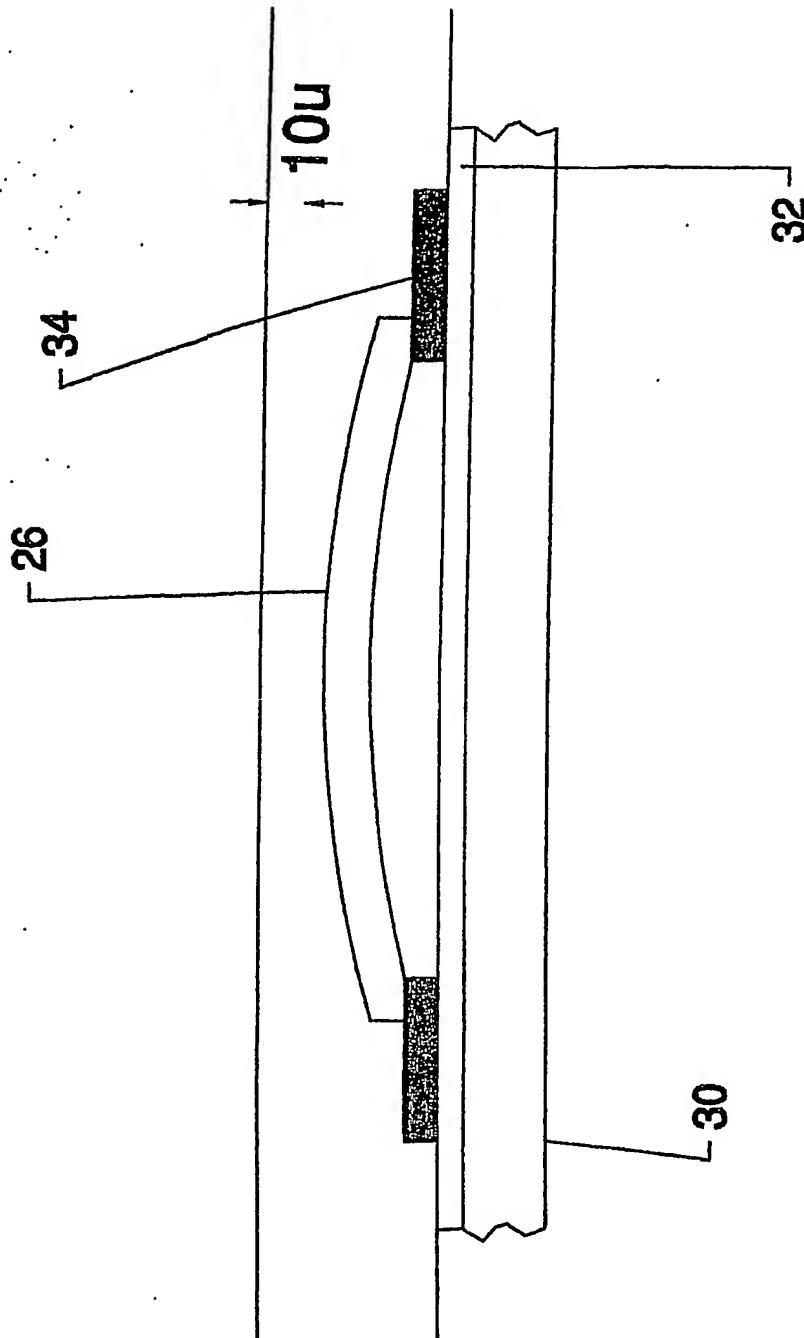


Figure 4

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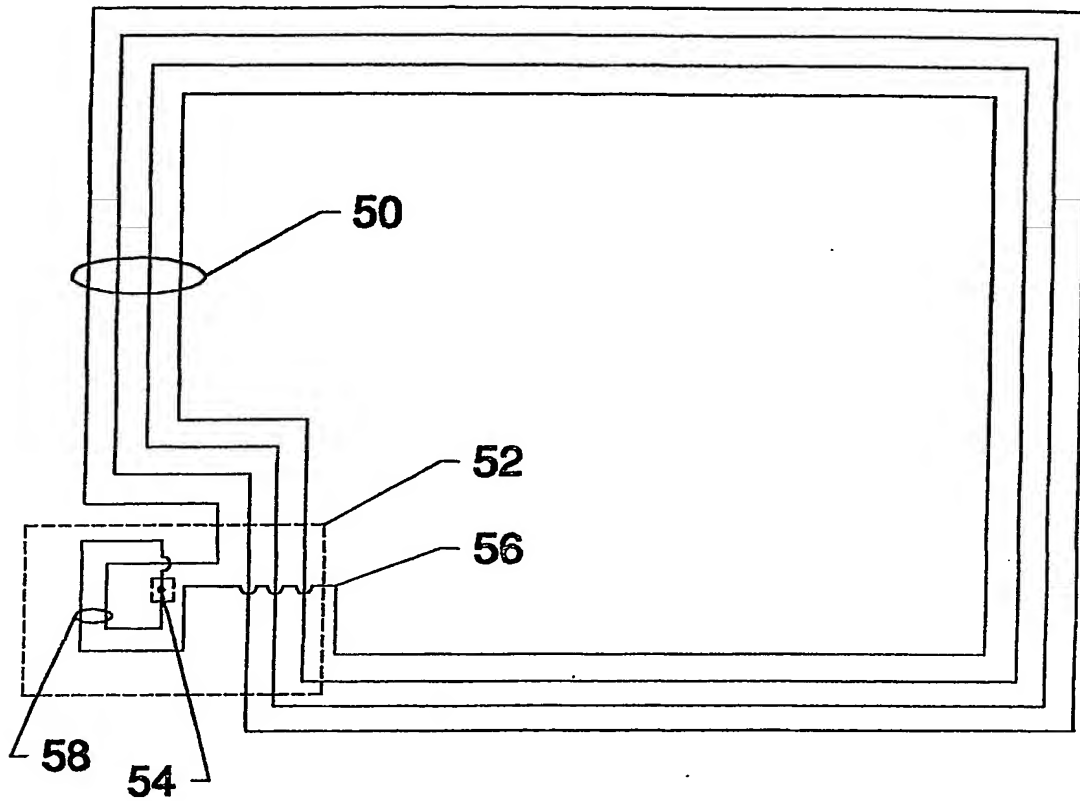


Figure 5

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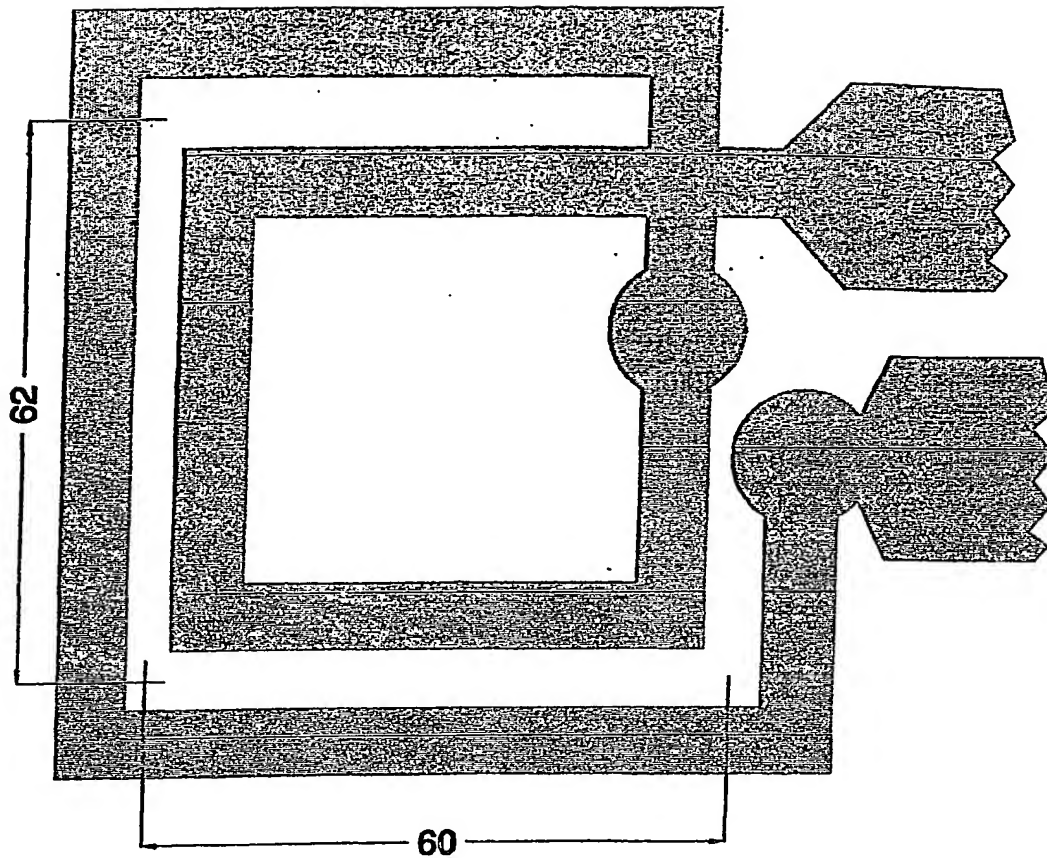


Figure 6

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